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(71) Applicant
Geoffrey John Hunter
4 Lincolnshire Terrace, Lanes End, Darenth, Kent, DA2 7JP, United Kingdom

(72) Inventor
Geoffrey John Hunter

(74) Agent and/or Address for Service
Geoffrey John Hunter
4 Lincolnshire Terrace, Lanes End, Darenth, Kent, DA2 7JP, United Kingdom

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(54) Vehicle braking circuit responsive to steering

(57) A braking circuit eg for a motorcycle front wheel has a piston 26 or relief valve which is connected with the chassis 4 and the steering mechanism 6 in such a way that when the steered wheel or wheels are turned from the designed neutral, i.e. straightahead, position the pressure of the hydraulic fluid is reduced thereby reducing the braking force and the risk of skidding. At the same instant in a secondary circuit fluid is forced from chamber 28 against a piston which transmits this force through a spring to oppose force applied to the pedal or lever operating the master cylinder.

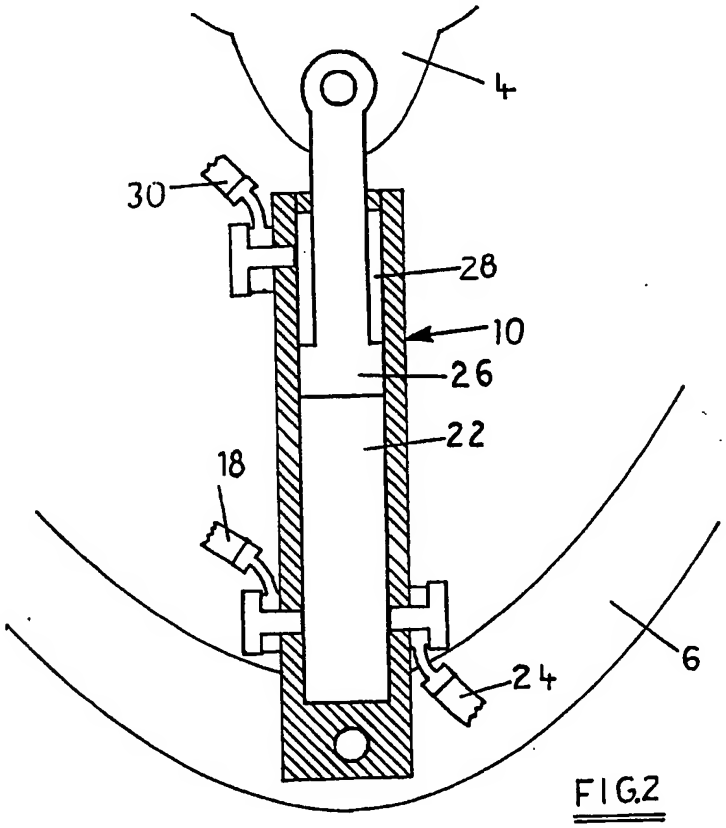

FIG.2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

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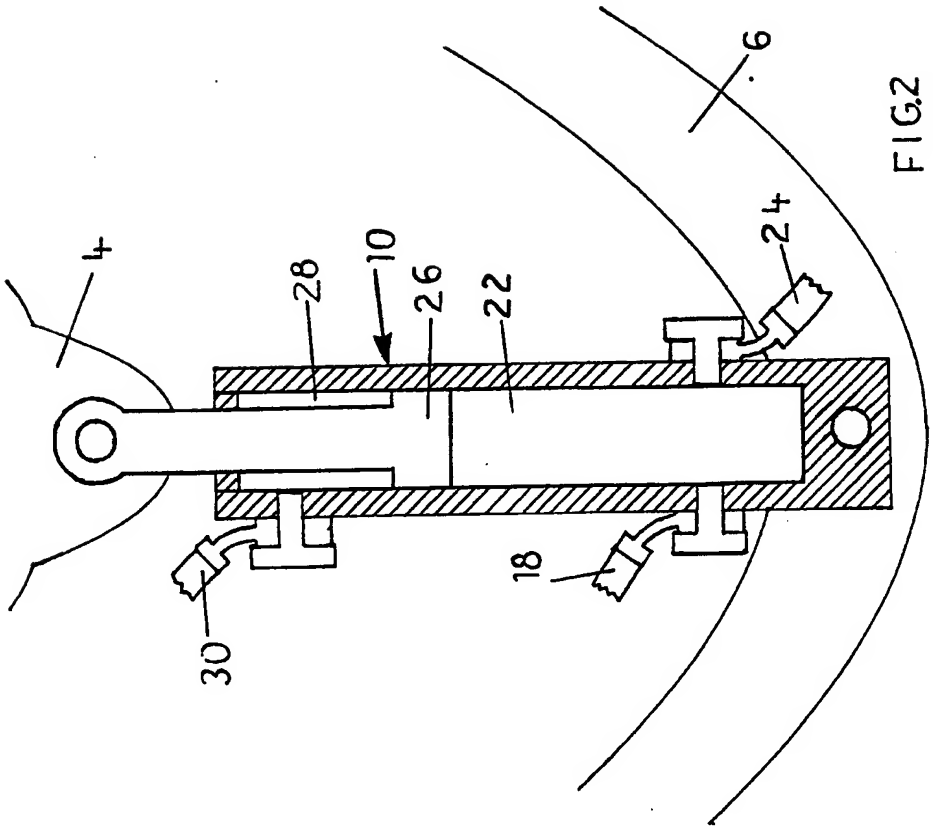

FIG.2

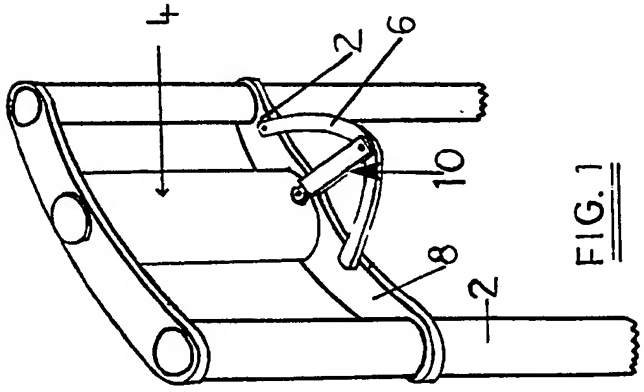

FIG. 1

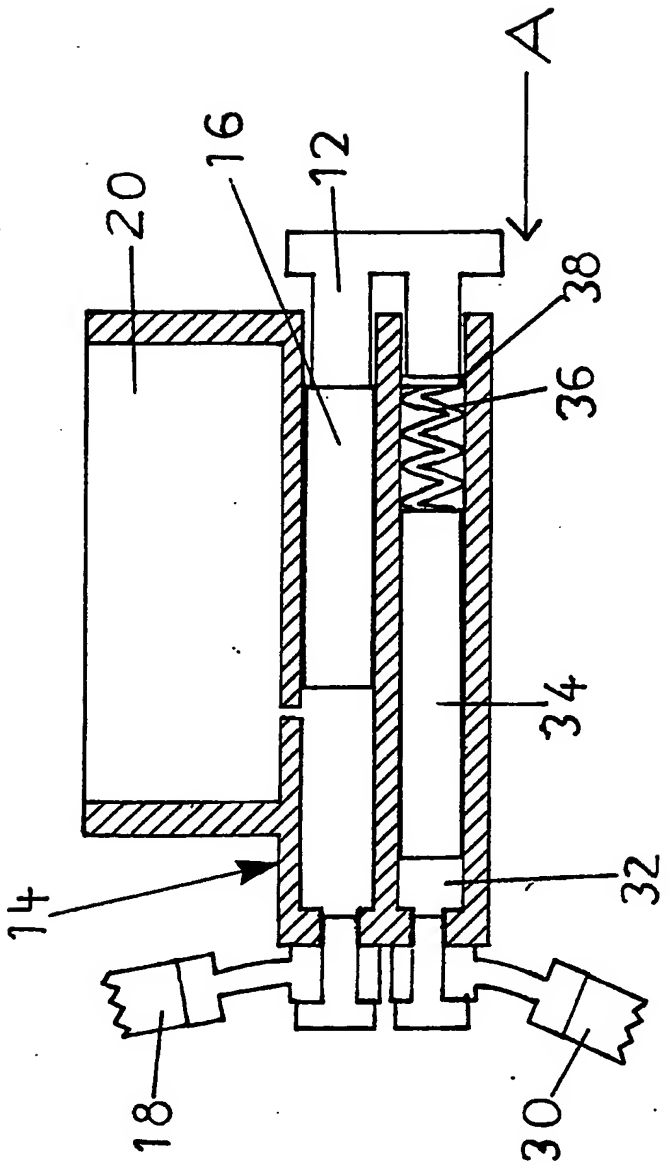

FIG.3

A WHEELED VEHICLE AND A BRAKING CIRCUIT THEREFOR

The present invention relates to a wheeled vehicle and to a braking circuit therefor.

A vehicle such as a motor-cycle is steered by way of steering means linked to its front wheel, and a brake for the motor-cycle acts on the front wheel. If the brake is applied such that the front wheel locks, the motor-cycle will skid. In this instance, the rider frequently finds himself turning the steering bars of the steering means such that directional control of the motor cycle is also lost. This is a very dangerous situation.

It is an aim of this invention to provide an anti-skid system for a vehicle such as a motor-cycle.

According to a first aspect of the present invention there is provided a wheeled vehicle comprising steering means coupled to a single wheel and having at least one steering bar arranged to effect steering of the single wheel upon being rotated or pivoted from a normal, straight position, a brake arranged to apply braking force to said single wheel, and a braking circuit including a brake pedal or lever for actuating said brake, wherein means are provided which are arranged to reduce the braking force applied to said single wheel in response to movement of said steering bar away from its normal, straight position.

It will be seen that means are provided to reduce the braking force in response to movement of the steering bar. Various means to reduce the braking force could be provided. For example a mechanical linkage could be provided and/or electrical control of the

braking force could be activated by way of electric or electronic switches responsive to the movement of the steering bar.

In a preferred embodiment, the braking circuit is hydraulic and comprises a master piston and cylinder unit, the brake pedal or lever being arranged to apply a force to the piston, and a fluid line coupling the cylinder of the unit to a brake such that the application of force to the piston causes the actuation of the brake by way of the increased fluid pressure in said fluid line. In this case, the means to reduce the braking force may comprise pressure reducing means to reduce the pressure in said fluid line.

In a preferred embodiment an intermediate piston and cylinder unit is provided and the fluid line coupling the master cylinder unit to the brake is arranged to comprise a first, pressure chamber of that intermediate unit. Thus, if the pressure in that pressure chamber is reduced, for example by movement of the piston, the pressure in the fluid line will be similarly reduced.

It will be appreciated, that if the fluid pressure in the fluid line decreases, it would be possible for the piston of the master cylinder unit to move further upon actuation of said brake pedal or lever. Accordingly, means are preferably provided to oppose brake applying movement of said brake pedal or lever upon a pressure reduction in the fluid line attributable to said pressure reducing means. Where the pressure reducing means is a piston and cylinder unit, reduction in fluid pressure in its first, pressure chamber will cause movement of its piston and thereby cause a consequential rise in pressure in a second, piston

chamber of the unit. This pressure rise can be used to oppose the actuation of the brake lever or pedal. For example, in a preferred embodiment, a further compensating piston and cylinder unit is arranged proximate to the master cylinder unit such that actuation of the brake pedal applies force not only to the master piston but also to a piston of said compensating piston and cylinder unit. The increased brake fluid pressure from said intermediate piston cylinder unit can be utilised to cause the piston of the compensating unit to oppose the brake applying movement of the brake pedal.

According to a further aspect of the present invention there is provided a hydraulic braking circuit comprising a master piston and cylinder unit, a brake pedal or lever arranged to apply a force to the piston, and a fluid line coupling the cylinder of the unit to a brake such that the application of force to the piston causes the actuation of the brake by way of increased fluid pressure in said fluid line, and pressure reducing means arranged in response to predetermined external stimuli to reduce the pressure in said fluid line, and further comprising means arranged to oppose the action of said brake pedal or lever in response to a reduction of pressure in said fluid line.

In a preferred embodiment an intermediate piston and cylinder unit is provided and the fluid line coupling the master cylinder unit to the brake is arranged to comprise a first, pressure chamber of that intermediate unit. Thus, if the pressure in that pressure chamber is reduced, for example by movement of the piston, the pressure in the fluid line will be similarly reduced. Means are preferably provided to oppose brake applying movement of said brake pedal or

lever upon a pressure reduction in the fluid line attributable to said pressure reducing means. Where the pressure reducing means is a piston and cylinder unit, reduction in fluid pressure in its first, pressure chamber will cause movement of its piston and thereby cause a consequential rise in pressure in a second, piston chamber of the unit. This pressure rise can be used to oppose the actuation of the brake lever or pedal. For example, in a preferred embodiment, a further compensating piston and cylinder unit is arranged proximate to the master cylinder unit such that actuation of the brake pedal applies force not only to the master piston but also to a piston of said compensating piston and cylinder unit. The increased brake fluid pressure from said intermediate piston cylinder unit can be utilised to cause the piston of the compensating unit to oppose the brake applying movement of the brake pedal.

In a preferred embodiment, the predetermined stimuli causing the pressure in said fluid line to be reduced is the locking of a wheel braked by said brake.

Embodiments of the present invention will hereinafter be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 shows schematically part of the steering means of a motor-cycle showing a pressure reducing unit for the braking circuit.

Figure 2 shows a plan view, partly in section, of the pressure reducing unit of Figure 1, and

Figure 3 shows a section through the master brake cylinder unit of a motor-cycle braking circuit of the invention.

Figure 1 shows part of the steering means of a motor-cycle showing two substantially parallel fork stems 2 to which steering bars (not shown) will be attached. The fork stems 2 extend through and are movable relative to framework of the motor-cycle generally indicated 4. A bracket 6 is connected to a brace 8 which connects the fork stems 2 and therefore moves together with the fork stems. One end of a intermediate piston and cylinder unit generally referenced 10 is fixed to the bracket 6. The other end of the piston and cylinder unit 10 is connected to the framework 4. It will be appreciated, that if there is relative movement between the fork stems 2 and the framework 4, the position of the piston in the intermediate piston and cylinder unit 10 will be altered thereby. In particular, in the embodiment illustrated, the intermediate piston and cylinder unit 10 is arranged to be in its shortest condition when the fork stems are in their normal, straight ahead position in which the front motor-cycle wheel (not shown) is also straight ahead. Pivoting or turning movements of the fork stems 2 relative to the framework 4 will thereby expand the intermediate piston and cylinder unit 10.

In known manner a brake lever (not shown) is supported by the steering bars of the motor-cycle, actuation of the brake lever being arranged to move a brake actuating block 12 of a master brake cylinder unit 14 which is illustrated in Figure 3. The actuation of the brake lever moves the brake block 12 generally in the direction of the arrow A whereby the piston 16 of the master cylinder unit 14 is moved towards the left as shown in Figure 3. This pressurises braking fluid in a fluid line indicated at 18 whereby a brake (not shown) is actuated. It will be seen, that in normal manner, the master brake cylinder unit 14 is in communication

with a brake fluid reservoir 20.

The fluid line 18 from the master brake cylinder unit 14 is in connection with a pressure chamber 22 of the intermediate piston and cylinder unit 10, which is illustrated in more detail in Figure 2. An outlet port of that pressure chamber 22 communicates with a further fluid line 24 which is connected to the brake (not shown). It will be appreciated that whilst the steering means of the motor-cycle are in their normal, straight ahead position, application of braking force to the brakes will be conventional, the pressure chamber 22 of the intermediate unit 10 simply defining part of the fluid line for braking fluid.

If the brakes are applied such that the wheel locks, there will be relative movement between the steering fork stems 2 and the fixed framework 4 such that a piston 26 of the intermediate unit 10 will be pulled in a direction outwardly of the pressure chamber 22 whereby the intermediate unit 10 will be extended. However, movement of the piston 26 in this way reduces the pressure in the pressure chamber 22 and hence applied to the brake. There will therefore be at least some reduction in the braking force applied to the wheel which should no longer remain locked.

The movement of the piston 26 to reduce the pressure in the pressure chamber 22 will conversely increase the pressure in a piston chamber 28 of the intermediate unit 10. The output line 30 of this piston chamber 28 is communicated with a compensating piston and cylinder unit 32 which is arranged adjacent to the master piston and cylinder unit 14. The further piston and cylinder unit 32 has a piston 34 which is also in contact with the brake applying block 12. It will

therefore be appreciated that if the pressure in the fluid line 30 increases it will tend to push the piston 34 towards the right as seen in Figure 3 and therefore will oppose the brake applying movement of the block 12.

In the embodiment illustrated a spring 36 is arranged between the piston 34 of the compensating cylinder 32 and an end piece 38 in contact with the brake applying block 12. This is a compression spring to increase the forces opposing the brake applying forces of the brake applying block 12.

A valve or restriction (not shown) may be provided in the compensating piston and cylinder unit 32 or may be associated with the fluid line 30 to enable the fluid pressure to be reduced when the steering means are returned to their normal straight ahead position.

It will be appreciated that modifications in and variations to the invention as described above may be made within the scope of this application. In particular, the invention is not limited to motor-cycles. It could be used for bicycles and/or with 3-wheel vehicles, powered or not, which have a link between steering means and their front wheel.

CLAIMS

1 A wheeled vehicle braking circuit wherein the applied force transmitted to the brake or brakes is reduced when the steered wheel or wheels are turned from the position designed to be the neutral position.

2 A wheeled vehicle braking circuit as claimed in Claim 1 wherein a secondary circuit opposes the force applied to the master circuit when the steered wheel or wheels are turned from the neutral position.

3 A wheeled vehicle braking circuit as claimed in Claim 1 or Claim 2 wherein an intermediate piston or relief valve is adapted to co-operate with the steered angle of the steered wheel or wheels in order to reduce the applied force transmitted to the brake or brakes.

4 A wheeled vehicle braking circuit as claimed in Claim 1 or Claim 2 or Claim 3 comprising a secondary circuit wherein a piston is adapted to co-operate with the steered angle of the steered wheel or wheels in order to apply force opposing the force applied to the master circuit.

5 A wheeled vehicle braking circuit as claimed in Claim 4 wherein the force applied by the piston in the secondary circuit in co-operation with the steered angle of the steered wheel or wheels is transmitted to oppose the force applied to the master circuit by a piston in co-operation with the lever or pedal which operates the master circuit.

6 A wheeled vehicle braking circuit substantially as described herein with reference to figures 1-2 of the accompanying drawings.

Amendments to the claims have been filed as follows

1 A wheeled vehicle braking circuit wherein a secondary circuit opposes the force applied to the master circuit when the steered wheel or wheels are turned from the neutral position.

2 A wheeled vehicle braking circuit as claimed in Claim 1 comprising a secondary circuit wherein a piston is adapted to co-operate with the steered angle of the steered wheel or wheels in order to apply force opposing the force applied to the master circuit.

3 A wheeled vehicle braking circuit as claimed in Claim 1 or Claim 2 wherein the force applied by the piston in the secondary circuit in co-operation with the steered angle of the steered wheel or wheels is transmitted to oppose the force applied to the master circuit by a piston in co-operation with the lever or pedal which operates the master circuit.

4 A wheeled vehicle braking circuit as claimed in Claim 1 or Claim 2 or Claim 3 wherein an intermediate piston or relief valve is adapted to co-operate with the steered angle of the steered wheel or wheels in order to reduce the applied force transmitted to the brake or brakes in co-operation with the secondary circuit.

5 A wheeled vehicle braking circuit substantially as described herein with reference to figures 1-2 of the accompanying drawings.

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